What is claimed is:

1. A reactor core mounted on a lower portion in a reactor pressure vessel comprising:

a core support plate mounted on a lower portion in said reactor pressure vessel;

an upper grid sat on above said core support plate;

a plurality of fuel assemblies, which are supported by said core support plate and said upper grid, arranged in a square grid at a certain pitch; and

a plurality of cross-sectional cruciform control rods having each four blades thereof, inserted into four adjacent spaces formed by said four fuel assemblies facing each other, wherein said reactor core is used to set a numeric value of 0.06 cm^{-1} or greater which is selected for the ratio (B/S) of a width (B) of each blade on said control rods and a surface area (S) of each fuel lattice defined by said surface area (S) of a square whose side is equal to the pitch between said fuel assemblies.

2. A reactor core as claimed in claim 1, wherein said fuel assemblies are arranged fuel rods and said fuel rods contain uranium, plutonium, or oxides or nitrides of the two elements as the nuclear fuel material.

3. A reactor core is claimed in claim 2, wherein said fuel rods disposed around said fuel assemblies contain thorium as the nuclear fuel material.

4. A reactor core as claimed in claim 1, wherein said fuel assemblies have some fuel rods in which a burnable poison is added, and a concentration of said burnable poison is adjusted to a level at which a reactivity of said

burnable poison is substantially zero when said fuel assemblies are discharged.

5. A reactor core as claimed in claim 4, wherein said c burnable poison is a gadolinia product containing pure particles or grains of Gd_2O_3 with a diameter of no less than 50 microns and no more than 200 microns, said gadolinia particles or grains are dispersed throughout the nuclear fuel material, and the weight ratio of gadolinia particles or grains to fuel rods is 15 wt% or greater.

6. A reactor core as claimed in claim 4, wherein said burnable poison is a gadolinia product, and combined enrichment of gadolinium isotopes with odd mass numbers in said gadolinia product is greater than the enrichment of natural gadolinium.

7. A reactor core as claimed in claims 1, wherein fuel assembly has a plurality of fuel rods changed with a fissionable material thereinto, and the mean enrichment of said fissionable material is the same for all loaded fuel assemblies.

8. A reactor core as claimed in claims 1, wherein fuel assembly has a plurality of fuel rods charged with a fissionable material thereinto, and the fissionable material concentration of said fuel assemblies is high in the lower portions of said fuel assemblies and low in the upper portions thereof, and the difference in enrichment between the lower and upper portions is 0.3 wt% or greater.

9. A reactor core as claimed in claims 1, wherein said cruciform control rods are inserted from above in said reactor pressure vessel.

10. A reactor core as claimed in claims 1, wherein said effective blade portions of said cruciform control rods are entirely composed of hafnium whose thickness is 0.8 cm or greater.

11. A method for operating a nuclear reactor, comprising the steps of:

mounting a reactor core on a lower portion in a reactor pressure vessel;

arranging a plurality of fuel assemblies in said reactor core in a square grid at a certain pitch;

inserting a plurality of cross-sectional cruciform control rods into four adjacent spaces formed by said four fuel assemblies facing each other;

setting a numeric value of 0.06 cm^{-1} or greater which is selected for a ratio (B/S) of a width (B) of each blade on said control rods and a surface area (S) of a fuel lattice defined by a surface are square whose said is equal to a pitch between said fuel assemblies; and

operating at an excess reactivity of no less than 5% Δk and no more than 10% Δk.

12. A method for operating a nuclear reactor, as claimed in claim 11, wherein operating effected that the maximum value of a core-averaged void coefficient observed during power operation of said nuclear reactor is generated at a time other than the end of an operating cycle, the minimum value of said core-averaged void coefficient is generated at the end of the operating cycle, and the difference between the minimum and maximum values of the core-averaged void coefficient is kept at 20% or greater.

13. A method for operating a nuclear reactor, as claimed in claim 11, wherein said reactor core is operated with said control rods inserted into said reactor core by 30% or greater of axial length of said control rods.

14. A method for operating a nuclear reactor, as claimed in claim 12, wherein said reactor core is operated with said control rods inserted into said reactor core by 30% or greater of axial length of said control rods.